

Chapter Three Morbidity

Introduction

Diabetes frequently leads to complications and co-morbidities. The major complications are diabetic ketoacidosis, blindness, kidney failure, and lower extremity amputation. The most common co-morbidities include coronary heart disease, stroke, hypertension, and peripheral vascular disease. Significant high risk of complications and co-morbidities in diabetes leads to more emergency visits, hospitalizations, increased mortality, decreased quality of life, and increased costs.

Prevalence

The statewide prevalence of diabetes was 8.1% in 2001. Studies have indicated that this figure might account for only two thirds of people with diabetes, and another one third of people with diabetes do not know they have it. It is estimated that there were 257,000 to 342,000 South Carolinians who have diabetes; the number has increased by 17,000 to 42,000 from the estimate in 1998. The prevalence of diabetes was higher among blacks (10.6%) than among whites (7.3%). The prevalence among black men (12.6%) was 73% higher than that among white men (7.3%). The overall prevalence of diabetes increased in the past 14 years, from 5.6% in 1988 to 8.1% in 2001. The prevalence of diabetes fluctuated during 1988 through 1997, and then increased persistently from 1997 to 2001. In addition to increase in overall prevalence, all race-sex specific prevalence increased in the past five years. The most dramatic increase (130%) in the prevalence of diabetes was observed among black men during 1988-2001 (Figure 31).

Figure 31. Prevalence of Self-Reported Diabetes by Race-Sex, SC 1988-2001.

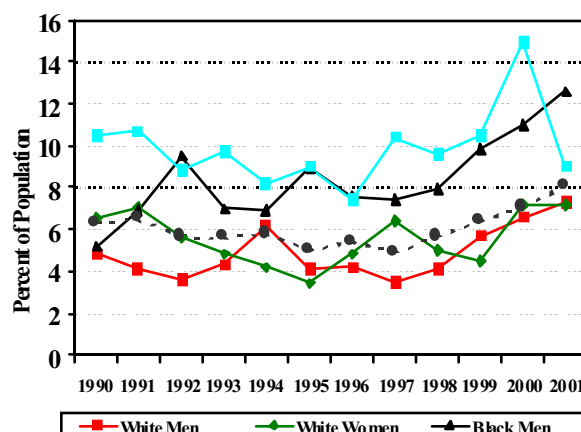
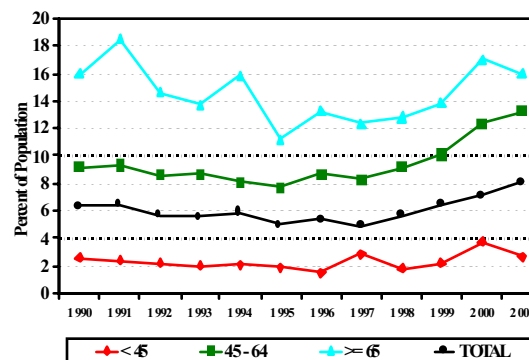


Figure 32 presents the prevalence of diabetes by age groups in 1988 to 2001. The prevalence of diabetes was higher among older people than among younger people. The prevalence of diabetes among people 65 years and older was seven times that of people under age 45. The prevalence tended to increase in all age groups during the past 14 years, except the prevalence among people age 65 and older, which fluctuated probably because of the small sample size in the BRFSS survey.

Figure 32. Prevalence of Self-Reported Diabetes among Adults by Age, SC 1990-2001.



The BRFSS survey asked the survey respondents how old they were when they were diagnosed with diabetes. The vast majority of diabetes is adult-onset diabetes. Nearly half of people with diabetes were diagnosed at age between 45 years and 64 years. Another one-third of people reported that they were diagnosed at age between 18 years and 44 years. Only 4% of people with diabetes reported that they were diagnosed when they were under age 18.

Figure 33. Age of Diagnosis of Diabetes among People with Diabetes, SC, 2000-2001.

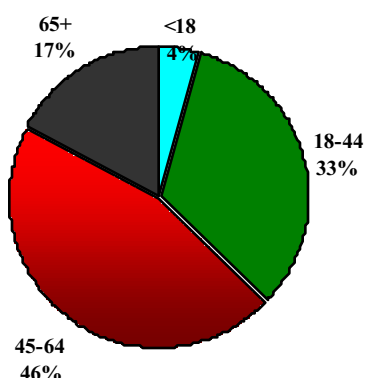
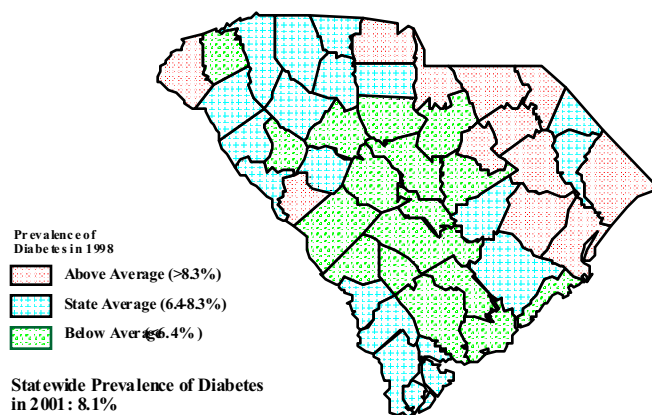


Figure 34 presents geographic distribution of the prevalence of diabetes in South Carolina in 2001. Ten out of 12 counties that had a prevalence of diabetes greater than the state average (8.1%) are those in Pee Dee and Waccamaw districts. Most of the counties with the prevalence lower than the state average are located in the central regions of the state.

Figure 34. Prevalence of Diabetes among Adults, SC, 2001



Hospital Discharges for Diabetes

Number of Discharges

Diabetes poses a significant burden on South Carolina health care systems. In 2001, 8,880 hospital discharges had diabetes as the primary diagnosis (the main reason of hospitalization), and 66,390 discharges had diabetes as a secondary diagnosis (a co-morbidity). Nearly one out of three black inpatients and one out of five white inpatients in South Carolina hospitals had diabetes in 2001.

Patients hospitalized with diabetes accounted for a significant portion of all patients hospitalized in South Carolina hospitals. Figure 35 shows the proportion of patients with diabetes to all inpatients was higher among blacks than among whites. The proportion increased by age, from less than 5% among patients under age 20, to more than 20% among patients age between 60 and 69.

Figure 35. Proportion of Hospitalizations with Diabetes of All Hospitalizations by Race-Age

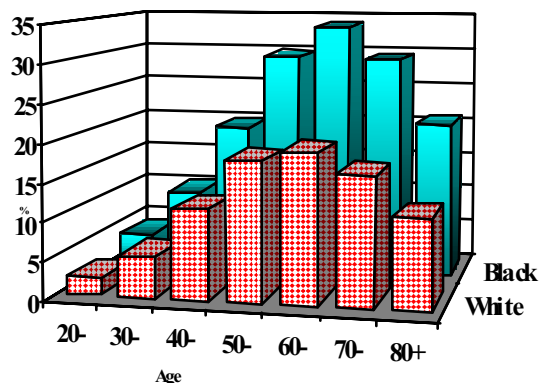
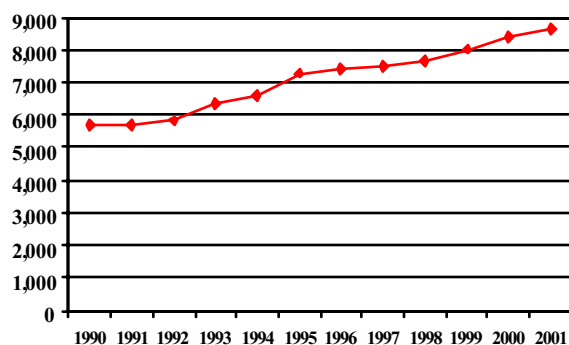


Figure 36 presents the total number of hospitalizations for diabetes as the primary diagnosis in South Carolina during 1987 to 2001. The number of hospitalizations for diabetes increased by 60% during the 14 years, a pace far faster than the increase in South Carolina population.

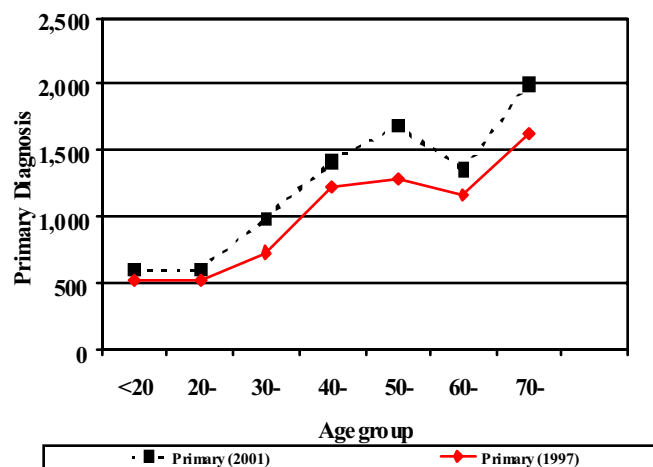
Figure 36. Total Number of Hospitalizations for Diabetes as the Primary Diagnosis, SC, 1987-2001



The number of hospitalizations for diabetes increases dramatically with the patient's age. In 2001, the number of discharges with diabetes as the primary diagnosis among older patients (70 years and older) was 3.4 times that among young patients (under age 20). As diabetes becomes more prevalent among older people, the number of hospitalizations for diabetes as a secondary

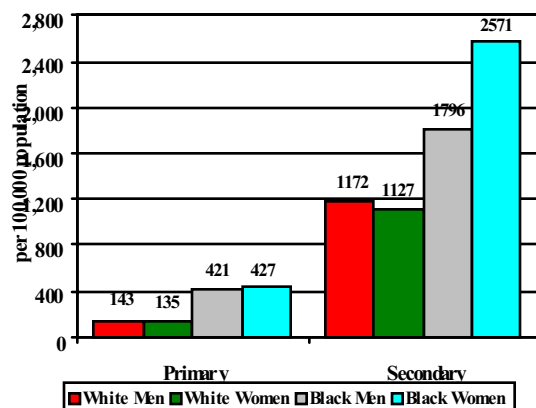
diagnosis among older patients becomes 88 times the number for young patients. Compared to the data in 1997, the number of hospitalizations for diabetes as the primary diagnosis increased for all age groups in 2001, (Figure 37).

Figure 37. Number of Hospital Discharges with Diabetes by Age, SC, 1997 and 2001



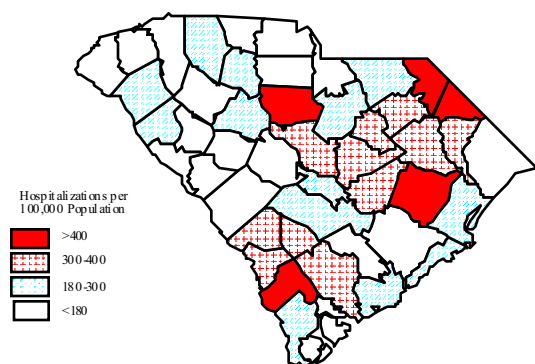
Blacks had a much higher hospitalization rate for diabetes than whites. The rates of hospitalizations with diabetes as the primary diagnosis among blacks were more than 420/100,000; three times the rates among whites. Moreover, the hospitalization rate for diabetes as a secondary diagnosis was disproportionately higher among blacks, especially among black women, than among whites (Figure 38).

Figure 38. Rate of Hospitalizations with Diabetes as Primary or Secondary Diagnosis



Counties that had a high rate of hospitalization for diabetes among their residents are primarily those that are located in the northeastern and southwestern regions of the state, especially in the Pee Dee districts. The data on the counties at the border with North Carolina (such as York, Cherokee, and Lancaster) or with Georgia (such as Aiken and Edgefield) might underestimate the rates of hospitalization for diabetes (Figure 39).

Figure 39. Age-Standardized Rate of Hospitalizations for Diabetes, (Primary Diagnosis), SC, 2001



Hospital Charges

In concordance with the increased number of hospitalizations for diabetes, the total hospital charges for hospitalization for diabetes as the primary diagnosis increased to \$104 million in 2001. The total charges for diabetes hospitalization almost increased \$5.8 million every year, in average, during 1987 to 2001 (Figure 40).

Figure 40. Total Hospital Charges for Hospitalizations for Diabetes as the Primary Diagnosis, SC, 1990-2001

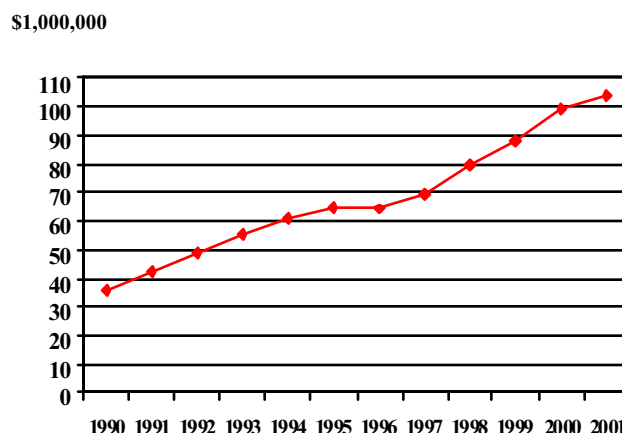
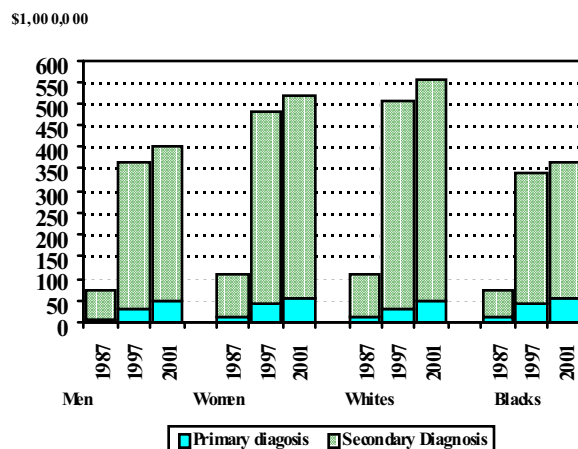


Figure 41 presents the total hospital charge for hospitalizations with diabetes as either the primary diagnosis or a secondary diagnosis in 1987, 1997 and 2001. Both charges for diabetes as either the primary diagnosis or a secondary diagnosis increased significantly between 1987 and 2001.

Figure 41. Total Charges for Hospitalization among Patients with Diabetes by Race-Sex, 1987, 1997, and 2001*

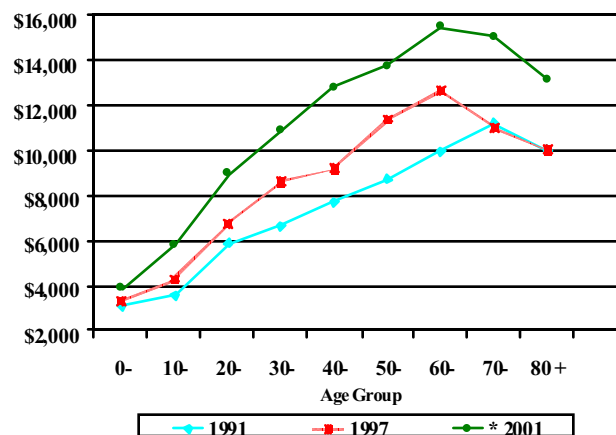


*2001 Hospital data did not include all secondary diagnoses; therefore, charge data may be incomplete.

The total charges for diabetes (as either the primary diagnosis or a secondary diagnosis) were \$928 million in 2001, more than five times the total charges in 1987 (\$183 million).

The increase in total charges for hospitalizations that is presented in Figure 41 was not only attributable to the increase in the number of hospitalizations in the past 14 years as shown in Figure 36, but also to the increase in average charges per hospitalization. Figure 42 compares the average charges in 1987, 1991, 1997 and 2001. In 1997 to 2001, the average charges increased for patients of any age group. The increase in average charges ranged from 155% among patients under age 20 to 255% among patients whose age was between 30 and 39. Figure 41 also illustrates that the average charges increased with patient's age, from \$4,000 for patients under age 10, to more than \$15,000 for patients aged 60 to 69 in 2001.

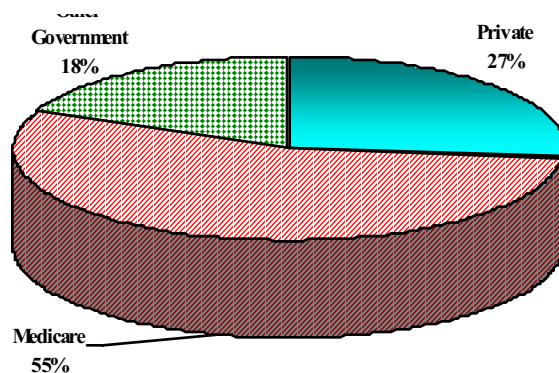
Figure 42. Change in Average Hospital Charge for Diabetes as Primary Diagnosis by Age, SC, 1991-2001*



*2001 Hospital data did not include all secondary diagnoses; therefore, charge data may be incomplete.

Who pays for the hospitalizations for diabetes as the primary diagnosis? Taxpayers paid approximately three quarters of the hospital charges through governmental programs. Medicare alone paid for more than half of the total charges in 2001 (Figure 43).

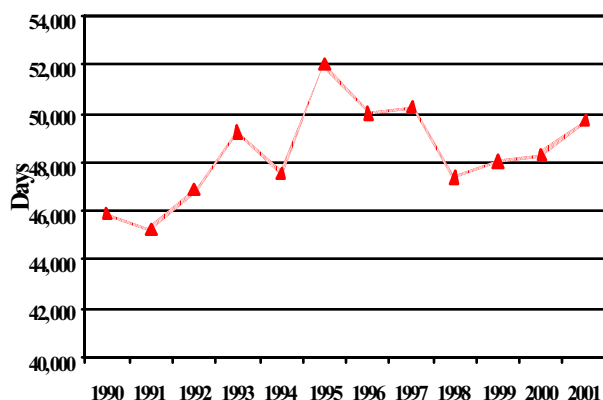
Figure 43. Sources of Payment for Hospitalization among Patients with Diabetes as the Primary Diagnosis, SC, 2001



Length of Hospital Stay

Patients with diabetes as the primary diagnosis stayed in hospitals for a total of 49,710 days (Figure 44). In contrast to a 60% increase in the number of total hospitalizations for diabetes as a primary diagnosis between 1998 and 2001 (Fig. 36), the total length of hospital stay for patients with diabetes only increased by 20%. The total length of hospital stay for diabetes has increased slowly since 1998 after a decline during 1995 to 1998, but remained less than that the number in middle 1990's.

Figure 44. Total Length of Hospital Stay for Patients with Diabetes as the Primary Diagnosis, 1990-2001

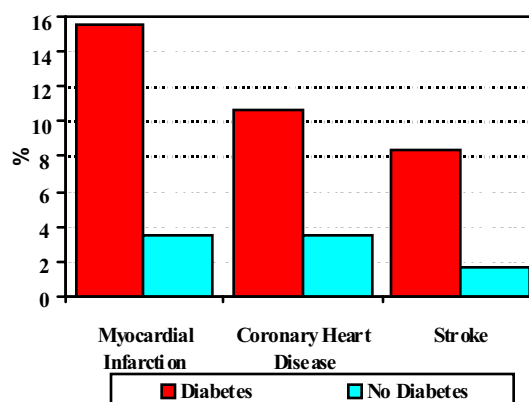


Complications

Diabetes significantly increases the risk of coronary heart disease, especially myocardial infarction, and stroke. The SC BRFSS surveyed South Carolina adults for the prevalence of coronary heart disease, myocardial infarction and stroke in 2000 and 2001. The data show that the prevalence of coronary heart disease among diabetics was triple that of nondiabetics, and myocardial infarction and stroke among people with diabetes were both five times the prevalence among people without diabetes (Figure 45). These data underscore the significance of

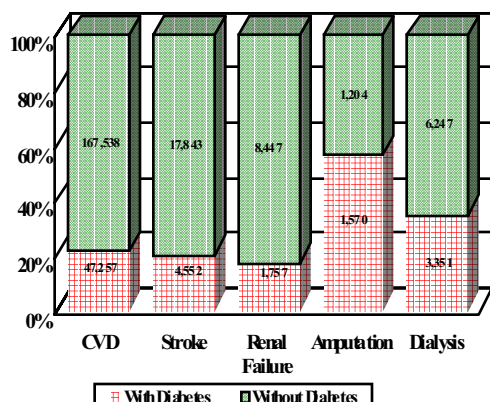
diabetes control and management of cardiovascular risk factors, which will not only lower the diabetes morbidity and mortality, but also contribute to prevention of cardiovascular diseases, the leading cause of death in South Carolina.

Figure 45. Prevalence of CVD and Stroke by Diabetes Status, SC, BRFSS 2000-2001



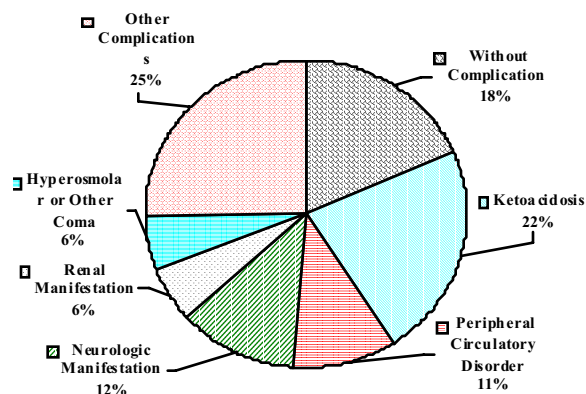
Hospital discharge data show that diabetes is a major cause of cardiovascular disease (not including stroke) and stroke. Figure 46 shows that among all patients hospitalized for cardiovascular disease and stroke, approximately 20% to 22% of patients had diabetes, a proportion that is significantly higher than the proportion of people with diabetes in general population. In addition to cardiovascular disease and stroke, patients with diabetes accounted for 17% of patients with renal failure and 35% of patients who underwent dialysis. Patients with diabetes comprised the majority of patients hospitalized for lower extremity amputation(s) in 2001. Fifty-seven percent of patients with lower extremity amputations were patients with diabetes, more than five times the frequency of people with diabetes in the general population.

Figure 46. Number of Hospitalizations for Major Diseases & Procedures by Diabetes Status, SC, 2001



Four out of five (82%) patients hospitalized for diabetes had diabetes complications in 2001. Ketoacidosis (22%), resulting from failure of glycemic control, remained the most common acute complication. Neurological manifestation was the second most common complication and was the diagnosis for 12% of patients with diabetes. Peripheral circulatory disorder, or loss of blood to the extremities (a complication associated with lower extremity amputation) was the complication among 11% of patients with diabetes. Other major complications include: 6% with renal manifestation, 6% with hyperosmolar coma or other coma, and 25% with a variety of other complications. The following set of figures present specific patterns for the most common complications of diabetes (Figure 47).

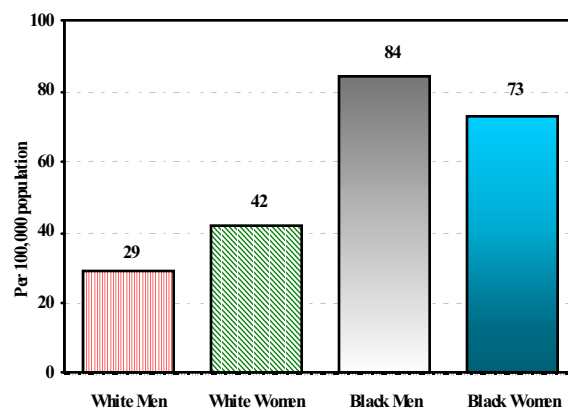
Figure 47. Distribution of Complications among Inpatients with Diabetes as Primary Diagnosis, SC, 2001



Diabetic Ketoacidosis

Ketoacidosis is a serious crisis for persons with diabetes, with high blood glucose, ketonemia and metabolic acidosis. Ketoacidosis is one of the most common acute complications seen among diabetes patients. Figure 48 shows the race-sex specific age-adjusted rate of hospitalization with Ketoacidosis. Blacks had a rate of hospitalization more than two times the rate among whites. Among four race-sex groups, black men had the highest rate (84/100,000) in 2001.

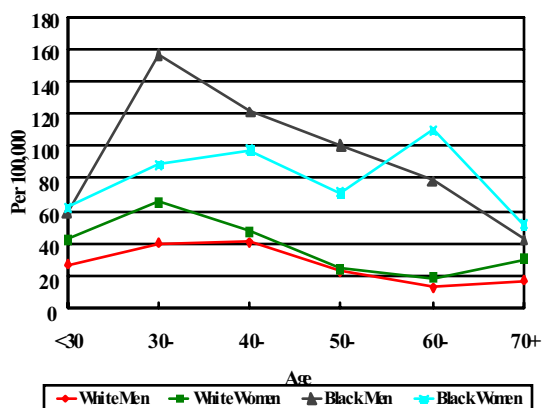
Figure 48. Age-Adjusted Hospitalization of Diabetic Ketoacidosis by Race-Sex, SC, 2001



The rate of hospitalization with ketoacidosis varies by patient's age. Figure 49 shows the

age-specific rate of hospitalization with ketoacidosis by race and sex. Blacks had a higher rate than did whites for all age groups. Black men had the highest rates among patients under age 55 years. The age-specific rate was high among patients age between 30 and 39, and declined by patient's age for white men, white women and black men. Rates among black women appeared to peak among patients age between 60 and 69.

Figure 49. Age-specific Hospitalization Rates of Diabetic Ketoacidosis by Race-Sex, SC, 2001



Diabetic Renal Failure and Dialysis

Renal failure (end-stage renal disease) is another very common manifestation of diabetes. After years of hyperglycemia accompanied with hypertension, diabetic nephropathy may lead to renal failure that requires lifelong dialysis or kidney transplantation. The rate of hospitalization for renal failure was disproportionately higher among blacks with diabetes than the rate among whites with diabetes. Figure 50 shows that black women with diabetes had the highest rate of hospitalization for diabetic renal failure in race-sex groups, which was more than three times the rate among white women with diabetes.

Figure 50. Age-Adjusted Hospitalization Rate of Diabetic Renal Failure by Race-Sex, SC, 2001

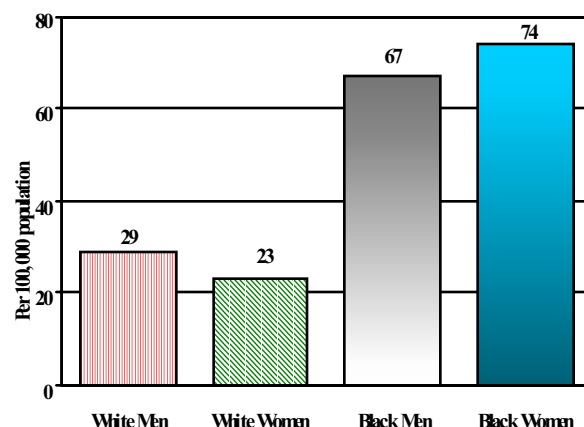


Figure 51 illustrates the pattern of the rate of hospitalizations for diabetic renal failure by age. The rate increased with patient's age in 2001. Almost two-thirds (63%) of hospitalizations for diabetic renal failure were for patients age 60 years and older. Dramatic increase in the rate of hospitalization for diabetic renal failure was observed among patients age 40 years and older. Blacks had a higher age-specific rate than the rate for whites. The racial disparity of the rate of hospitalization for diabetic renal failure widened with age, especially among patients age 60 and older. There was little gender difference in the age-specific rates, except that among old patients (age 70 years and older).

Figure 51. Age-Specific Hospitalization Rate of Diabetic Renal Failure by Race-Sex, SC, 2001

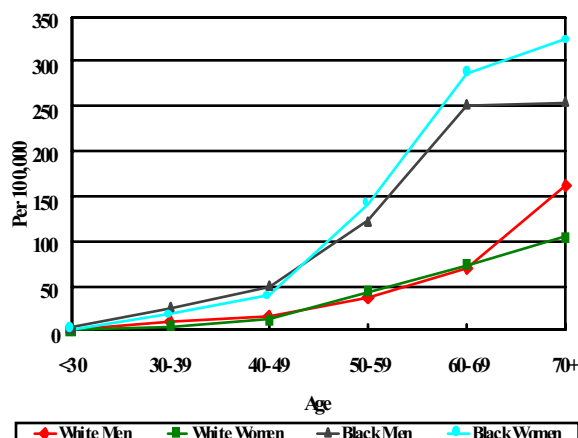
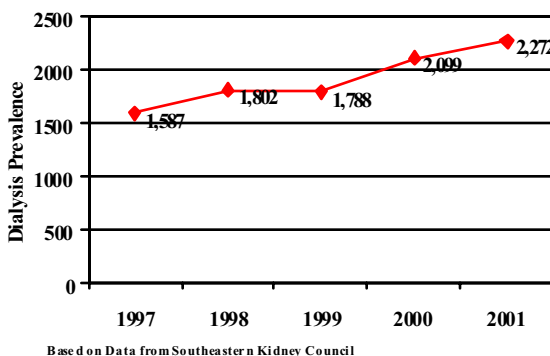


Figure 52 presents the total number of patients with diabetes on dialysis in South Carolina, based on data collected by the Southeastern Kidney Council. The number of patients with diabetes on dialysis has increased by 43% since 1997.

Figure 52. Dialysis Prevalence with Diabetes as Major Diagnosis, SC, 1997-2001.

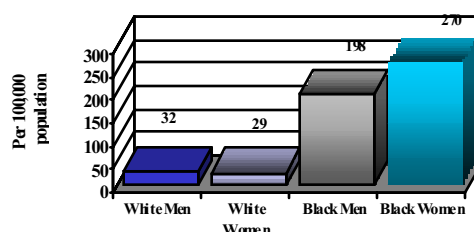


The vast majority of renal dialysis is now taking place in freestanding dialysis centers scattered around the state, and very little is taking place on an inpatient basis, except where the patient has been hospitalized for another reason.

Blacks had a rate of hospitalization for diabetic dialysis higher than whites. The rate among black men was six times the rate

among white men, and black women had a rate nine times the rate among white women (Figure 53).

Figure 53. Age-Adjusted Hospitalization Rate of Diabetic Dialysis by Race-Sex, SC, 2001



Diabetic Lower Extremity Amputation

The hospitalization rate for diabetic lower extremity amputation was disproportionately higher among black males than among black females or whites of either sex. In 2001, the rates among black males were 50% higher than rates in black females or white males, and four times the rates among white females, who consistently had the lowest rates (Figure 54). One very encouraging trend that has occurred is a fall in hospitalization rates for lower extremity amputation in people with diabetes from 39/1000 to 21/1000 diabetes patients (45%) between 1997 and 2001. This is consistent among racial and gender groups. The age-specific rates increase with advancing age, especially among blacks (Figure 55).

Figure 54. Hospitalization Rate of Diabetic Lower Extremity Amputation by Race-Sex, SC, 1997-2001

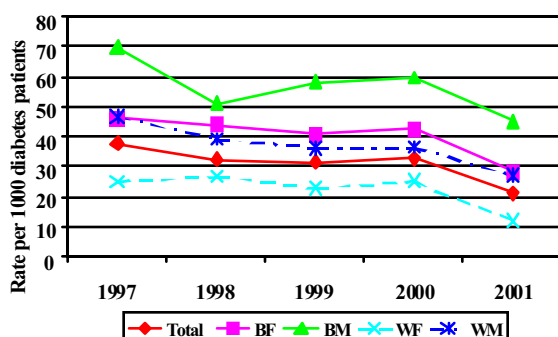
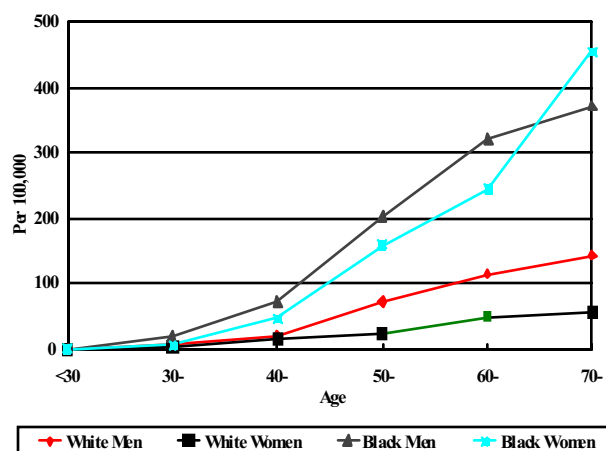


Figure 55. Age-Specific Hospitalization Rates for Diabetic Foot Amputation by Race-Sex, SC, 2001



Gestational Diabetes

Gestational diabetes is associated with infant mortality, congenital malformations and complications of labor and delivery. In general, two to three percent of pregnant women are diagnosed with gestational diabetes. According to South Carolina Vital Statistics, approximately 1,700 to 1,900 pregnant women are diagnosed with gestational diabetes each year. Figure 56 shows the number of live births to mothers with gestational diabetes in 1990 to 2001. There were 1,951 live births to mothers with

gestational diabetes in 2001. The percentage of live births to mothers with gestational diabetes was 3.5 percent of live births in 2001, increased from 2.5 percent in 1990.

Figure 56. Number of Live Births by Mother's Diabetes Status, SC, 1990-2001

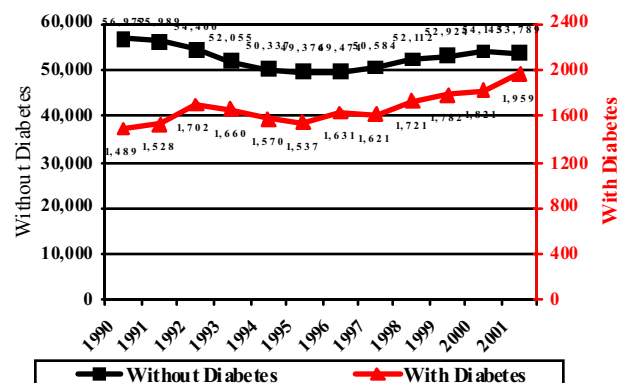
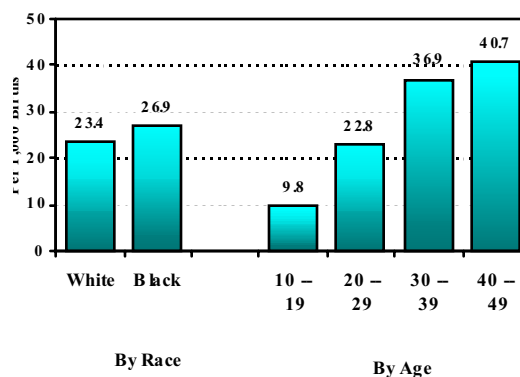


Figure 57 illustrates that the rate of hospitalization for gestational diabetes was slightly higher among blacks than among whites, and increased with age of pregnant women. The rate of hospitalization for gestational diabetes among women age 40 years and older was almost four times the rate among women under 20 years of age.

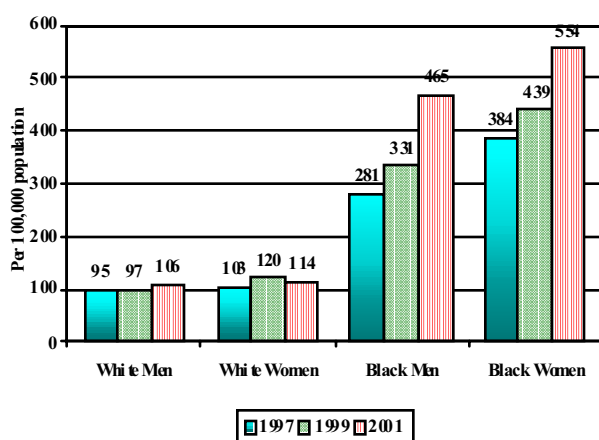
Figure 57. Age-Adjusted Hospitalization Rate of Gestational Diabetes, SC, 2001



Emergency Room Visits

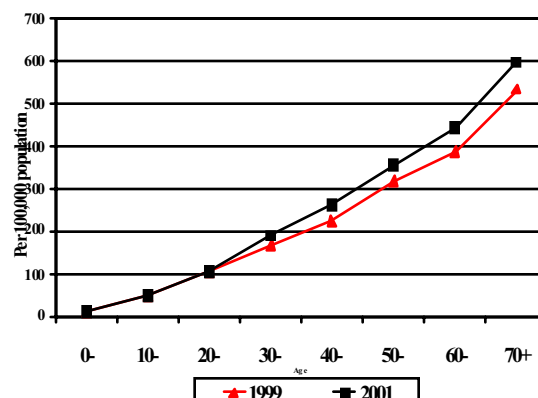
There is a striking racial disparity in the rates of emergency room visits for diabetes. In 2001, the rate of emergency room visits for diabetes as the primary diagnosis among blacks was more than five times the rate among whites (Figure 58). Compared to the data in 1997, the rate of emergency room visits increased among blacks and the racial disparity in the rate of emergency room visit broadened in 2001.

Figure 58. Age-Adjusted Rate of ER Visits for Diabetes as the Primary Diagnosis by Race-Sex, SC, 1997-2001



The rate of emergency room visits for diabetes increases with age. The rate was the highest (599/10,000) for patients age 70 and older. The age-specific rate among patients age 30 years and older increased significantly during 1999 and 2001 (Figure 59).

Figure 59. Rates of ER Visits with Diabetes as the Primary Diagnosis by Age, SC, 1999 and 2001



The rate of emergency room visits for diabetes varied among 46 counties in South Carolina (Figure 60). Fifteen counties that had a rate of emergency room visits for diabetes greater than 300/100,000 in 2001 are located in an area situated from the northeastern part of the state to the southwestern area of the state. The majority of counties with a high rate of emergency room visits have a high prevalence of diabetes and/or a high proportion of minorities in their populations.

Figure 60. Age-Standardized Rate of ER Visits for Diabetes, (Primary Diagnosis), SC, 2001

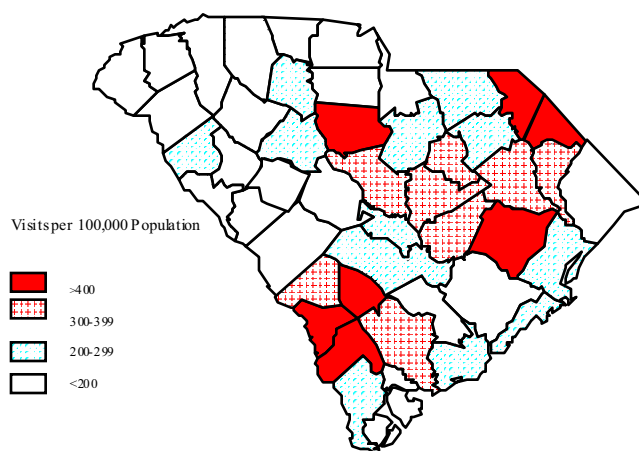
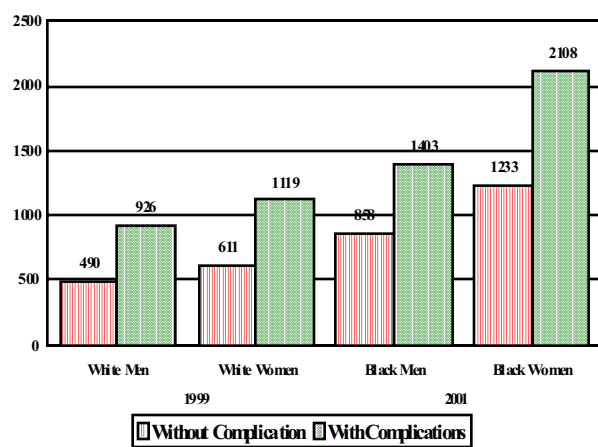


Figure 61 presents the number of emergency room visits for diabetes, both with and

without diabetes complications. Women had more emergency room visits for diabetes than did men, and blacks had more visits than did whites. Approximately two thirds of patients who visited emergency room for diabetes had diabetes complications.

Figure 61. Number of ER Visits with Selected Diabetic Complications by Race-Sex, SC, 2001



Repeated Emergency Room Visits for Diabetes

Repeated emergency room visits for diabetes is an indicator of patient's lack of diabetes care and/or lack of access of health care. Repeated ER visits are preventable through appropriate diabetes management and patient education. In 1999, a total of 917 patients visited the emergency room more than once for diabetes (Figure 62). Forty-seven patients even visited the emergency room for five or more times in 1999. The number of patients with repeated ER visits for diabetes increased by 42%, from 647 in 1996 to 917 in 1999.

Figure 62. Number of Patients with Multiple ER Visits for Diabetes as Primary Diagnosis, SC, 1996 and 1999

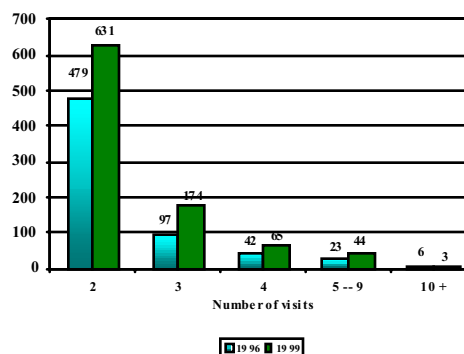
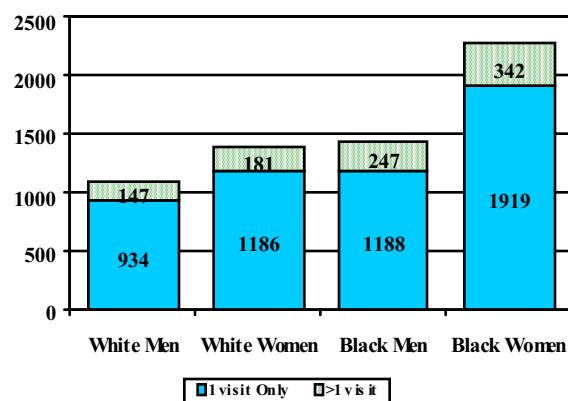


Figure 63 compares the patterns of single ER visits versus repeated ER visits among race-sex groups. More women made repeated ER visits than did men, and more blacks made repeated ER visits than did whites. Black women had the greatest number of both single visit and repeated visits than any other race-sex group.

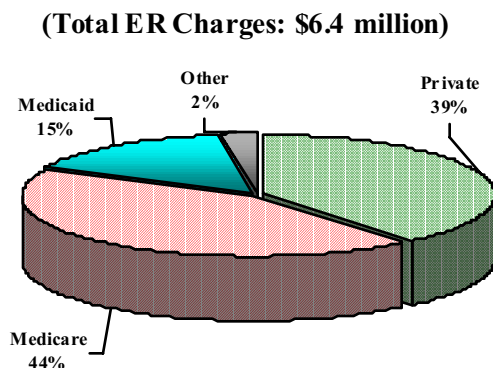
Figure 63. Number of Patients with One or Multiple ER Visit(s) for Diabetes as Primary diagnosis by Race-Sex, SC, 1999.



Since repeated ER visits are mostly preventable, charges for repeated ER visits impose an avoidable financial burden on payers. The total charges for repeated ER visits was \$6.4 million in 2001. Figure 64 shows that nearly 60% of this cost was paid

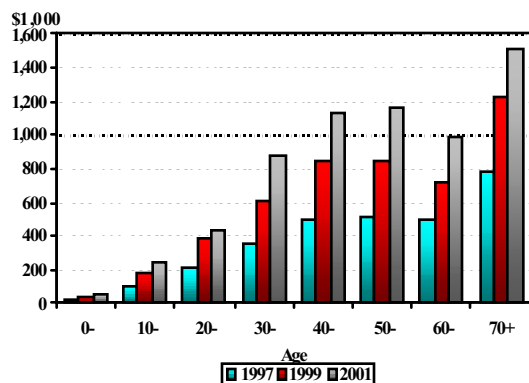
by tax payers through Medicare and Medicaid in 2001.

Figure 64. Sources of Payment for Diabetic Patients with Multiple ER Visits, SC, 2001



Total hospital charges for emergency room visits for diabetes increased with patient's age. The age-specific total charges increased from \$306,000 for patient age under 20 years to \$1.5 million for patient age 70 years and older. Figure 65 compares the age-specific hospital charges in 1997 to 2001. The total charges increased approximate 115% from 1997 to 2001. In addition, all age-specific charges increased by anywhere from 92% to 152% between 1997 and 2001.

Figure 65. Total Charges for ER Visits with Diabetes as the Primary Diagnosis by Age, SC, 1997-2001



Summary

The prevalence of diabetes in South Carolina has been increasing and at 8.1%, it is among the highest in the country. Prevalence increases with age. Total numbers of hospital discharges with a primary diagnosis of diabetes are increasing. Total hospital charges for diabetes also have been increasing, and in 2001 were \$928 million. Average hospital charges are also increasing, and highest charges are seen in those over age 50. Medicare paid for over half of total charges in 2001. Length of hospital stay has changed very little in recent years. The prevalence of myocardial infarction and stroke are increased 5-fold among people with diabetes in South Carolina. Hospitalization rates for renal failure are more than doubled among blacks when compared with whites. Dialysis prevalence among diabetics has increased 43% in 5 years.

A problem area is the increasing use of the emergency room for diabetes visits over the past four years. In 2001, the rates among blacks were more than 5 times those of whites. Diabetic patients with ER visits increased by 46% between 1996-99. Total charges for ER visits by people with diabetes rose 115% between 1997 and 2001. Total charges in 2001 were \$6.4 million, 44% were Medicare and 15% Medicaid.

In summary, we have a major problem in caring for people with diabetes in South Carolina. A major factor is the increasing prevalence of the disease, which may be primarily due to an alarming increase in overweight or obese people to 65% of our South Carolina population. Hospital charges are close to \$1 billion each year and there has been an increasing use of the emergency room for care.

A very encouraging trend is the more than 40% decrease in hospitalization for lower

extremity amputations. This may be a direct result of aggressive efforts to educate persons with diabetes on foot care and the

importance of regular foot exams, both self-checks and by their health care providers